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Effect of Different Date of Sowing on Rice (*Oryza sativa* L.) Seedling Blight Disease under Nursery Conditions

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Authors' contributions

This work was carried out in collaboration between both authors. Authors PPR and KN, both the author's deign an experiment, prepared the materials and conducted experiment. Author PPR analyzed data performed the statistical analysis and drafted the manuscript. Author KN edited previous versions of the manuscript. Both authors have read and approved the final manuscript.

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ABSTRACT

Aims: The main objective of this study was to find appropriate suitable period for raising rice nurseries to summer cultivation for improved seed germination and reduced seedling mortality in nursery under South Gujarat conditions of India.
Study Design: Large Plot Technique.
Place and Duration of Study: Regional Rice Research Station, Navsari Agricultural University, Vyara, Gujarat (Zone II, Agro ecological situation V), India during 2020-21.
Methodology: Seeds of rice variety GNR-3 was sown in raised bed nursery at 10 days interval from 20 November, 2020 to 9 January, 2021 under open field condition. .Frequently light irrigation gave to maintained soil moisture. Per cent seed germination (%), seedling mortality, root and shoot length (cm) were recorded at 21 days after sowing (DAS) and 35 DAS.
Results: the present studied revealed that highest seed germination 62.83 per cent was observed in seeds was sown on 30th November. Whereas minimum seedling mortality 10.03 percent was recorded in seeds sown on 20th November, at 21 days after sowing (DAS).While, maximum seedling mortality, 39.93 per cent was recorded in seed sown on 9th January. Similarly, at 35 DAS,

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minimum seedling mortality 17.25 per cent was recorded in seeds sown on 20th November. Maximum seedling mortality (43.76%) was observed in seeds sown on 9th January. Maximum root length 11.30 cm was recorded in seeds sown on 9th January. Maximum shoot length 26.6 cm was observed in seeds sown on 30th November.

Conclusion: Highest per cent seed germination, minimum seedling mortality and good root and shoot growth were observed in rice nursery sown between 20-30 November.

Keywords: Seed germination; seedling; mortality; root and shoot.

1. INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important food-grain in the world, accounting for more than 20 per cent of global calories consumed. Rice is the second largest produced cereal in the world. India is one of the world's largest producers of rice, it occupies an area of 43.79 MHa, production of 116.42MT and productivity of 2.659 tones/ha [1]. In Gujarat it occupies an area of 8.38 lakh ha, production of 1.91MT and productivity of 2278 kg/ha [2]. In summer season rice is grown in Surat, Navsari, Valsad and Tapi districts, where canal water is available [3]. Majority of the farmers prefer to grow coarse grain varieties *viz*., Gurjari, Jaya, GNR 3 and GR-17 (Sardar). Coarse grain type rice is used for the preparation of poha (flattened rice) and mamara (popped rice) on very large scale in South Gujarat. Rice crop affected by so many diseases such as seedling blight, blast, sheath blight, sheath rot, brown spot, false smut, water-mold and seed-rot and bacterial leaf blight have been reported from many rice growing areas of India. Among that seedling blight or damping off is an important disease complex caused by several seed borne and soil borne fungi e.i., *Cochiobolus* sp., *Curvularia* sp., *Sarocladium* sp., *Fusarium* sp., *Rhizoctonia* sp., and *Sclerotium* sp. [4]. Rice seedling blight disease is caused by *Sclerotium rolfsii* in the rice nursery of the boro season [5]. Rice seedlings are weakened or killed by the fungi. Cold and wet weather environmental conditions favorable for disease development [4]. Blighted seedlings that emerge from the soil die soon after emergence. Seedlings survive generally lack of vigor's are yellow or pale green, and do not compete well with healthy seedlings. Rice seedling blight disease caused by several pathogens and influenced by low temperature and alkaline of soil [6]. Rice seedling rot disease caused by *Curvularia lunata* and *Helminthosporium oryzae* [7]. Seedling blight is more severe in rice that has been seeded early when the soil is usually cold and damp. Conditions that tend to delay seedling emergence favour seedling blight. Seedling blight of rice affected at the time of germination can be reduced by treating the seed with fungicides. The main objective of this study was to find appropriate suitable period for raising rice nurseries to summer cultivation for improved seed germination and reduced seedling mortality in nursery conditions .Per cent seed germination, seedling mortality, root and shoot length were observed.

2. MATERIALS AND METHODS

The experiment was conducted during the season *Summer*-2020-21 under nursery conditions. In nursery, rice seeds 50 g seeds (aprox. 1600 seeds) were sown in each plot at different intervals. Six different dates of intervals sowing as treatments were laid out with four replicated in large plot technique. Pots has gross area 1.1x1.1 m; net area1.0 × 1.0 m. 50g seeds of rice variety GNR-3 was sown in each replicated plot at 10 days interval *viz*., 20th November 2020, 30th November 2020, 10th December 2020, 20th December 2020, 30th December 2020 and 9th January 2021. Fertilizer applied 50 g DAP as basal dose and 50 g ammonium sulphate at 20days after sowing. Irrigation gave as per requirement.

During study period weekly maximum temperature ranged between 29.7 - 37.3 ^{0}C and minimum ranged between 12.1-19.3 ^{0}C. While, weekly morning relative humidity in ranged between 87.4-95.9 per cent and evening 86.5-93.4 per cent. Cloud covered in ranged between 0.0 to 2.3 hrs/days. The soil of experimental field was clayey in texture. Low in organic carbon (0.13%), low in available nitrogen (103 kg/ha.) medium in available phosphorus (32.2 kg/ha.) and high in available potassium (289 kg/ha.) and slightly alkaline in reaction with 7.6 pH.

Observations of seed germination (%), seedling mortality, root and shoot length (cm) were recorded at 21 DAS and 35 DAS were recorded.

$$\text{Germination (\%)} = \frac{\text{Number of germinated seeds}}{\text{Total number of seeds sown}} \times 100$$

$$\text{Seedling mortality (\%)} = \frac{\text{Number of dead seedling}}{\text{Total number of observed seedling}} \times 100$$

3. RESULTS AND DISCUSSION

Effect of different date of sowing on seed germination, seedling mortality and seedling vigor's is concerned with seedling height and root length. The results are presented in Table 1 revealed that a significant different was recorded among the treatment to seed germination, seedling mortality, seedling and shoot height. Maximum seed germination (62.836%) was observed in treatment T_2 (seeds sown on 30th November, 2020) followed by treatment T_1 (seed sown on 20th November, 2020) with 53.35 per cent seed germination. Least seeds germination was recorded in treatment T_5 (seed sown on 30th December, 2020) with 38.30 per cent.

Results from rice nursery experiments revealed that a statistically significant difference was observed between the treatments to seedling mortality at 21 and 35 DAS (Table 1, Fig. 1). Minimum seedling mortality 10.03 per cent at 21 DAS was recorded in treatment T_1 (seed sowing on 20th November, 2020) which was at par with treatment T_4 (seed sowing on 20th December, 2020) and T_2 (seed sowing on 30th November, 2020) by 12.12 and 12.64 per cent, respectively. Maximum seedling mortality (39.93%) was recorded in treatment T_6 (seed sowing on 9th January, 2021).

While seedling mortality at 35 DAS found statistically significant different in all the treatments. Minimum mortality (17.25%) was found in treatment T_1 (seed sowing on 20th November, 2020). It was at par with treatment T_4 and T_2 with 18.35 and 20.22 per cent, respectively. Maximum seedling mortality (43.76%) was observed in treatment T_6 (seed sowing on 9th January, 2021). Seedling blight due to *Sclerotium rolfsii* was observed in nursery beds of rice and affected seedlings were observed in irregular patches. Affected seedlings were turned brown and showed yellowing of leaves followed by seedling mortality. White mycelial growth and white small round sclerotia were produced on roots as well as on stem bases then later turned brown [8].

Maximum root length (11.30 cm) was recorded in treatment T_6 (Seed sowing on 9th January, 2021) which was at par with Treatment T_1 (Seed sowing on 20th November, 2020) with 10.22 cm (Table 1, Fig. 2). Minimum root length (6.68 cm) was observed in treatment T_5 (Seed sowing on 30th December, 2020). Maximum shoot length (26.6 cm) was observed in treatment T_2 (Seed sowing on 30th November, 2020) followed by treatment T_3 (Seed sowing on 10th December, 2020) with 19.95 cm shoot length. Minimum shoot length was recorded in treatment T_6 (Seed sowing on 9th January, 2021) which was 12.04 cm. Minimum root and shoot length during December may due to low temperature at night during seedling development stage while it was slightly more in November. Results were found similar with earlier workers Iwuagwul et al. [9] who conducted experiment on different planting dates *viz*., early June (EJ), late June (LJ), early July (EJY) and late July (LJY) and showed early sowing had the highest

Table 1. Effect of different date of sowing on rice seed germination, seedling mortality, root and shoot length

Treatment	Date of sowing	Germination (%)	Mortality % at 21 DAS	Mortality % at 35 DAS	Root length (cm)	Shoot length (cm)
T_1	20 November 2020	53.35 (46.95)*	10.03 (18.44)	17.25 (24.32)	10.22	19.30
T_2	30 November, 2020	62.83 (52.48)	12.64 (20.74)	20.22 (26.55)	9.15	26.60
T_3	10 December, 2020	42.34 (40.59)	17.54 (24.74)	24.57 (29.71)	8.83	19.95
T_4	20 December, 2020	41.59 (40.15)	12.12 (20.35)	18.35 (25.34)	7.95	16.43
T_5	30 December, 2020	38.30 (38.22)	17.46 (24.55)	25.73 (30.41)	6.68	12.41
T_6	9 January, 2021	44.39 (41.78)	39.93 (39.19)	43.76 (41.42)	11.30	12.04
SEm±		**1.49**	**1.00**	**1.44**	**0.39**	**0.79**
CD at 5%		**4.42**	**2.96**	**4.27**	**1.17**	**2.34**
CV %		**6.86**	**8.09**	**9.70**	**8.72**	**8.86**

*Average of four replication. *Figures in the parentheses are arc sine transformed value*
Critical difference (CD), Standard error of the mean (SEM), Coefficient of variation (CV)

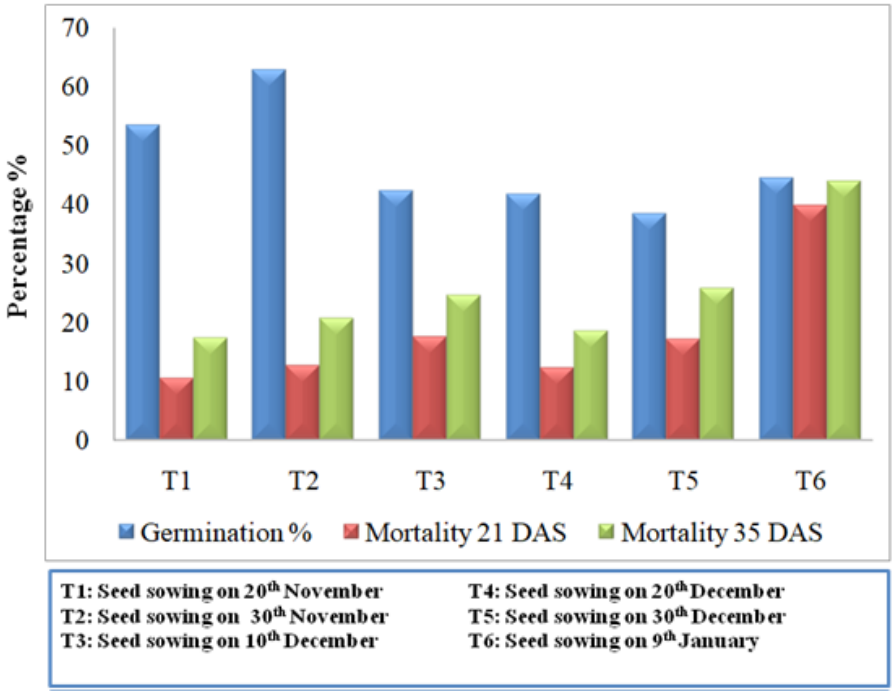

Fig. 1. Effect of different date of sowing on rice seeds germination and seedling morality

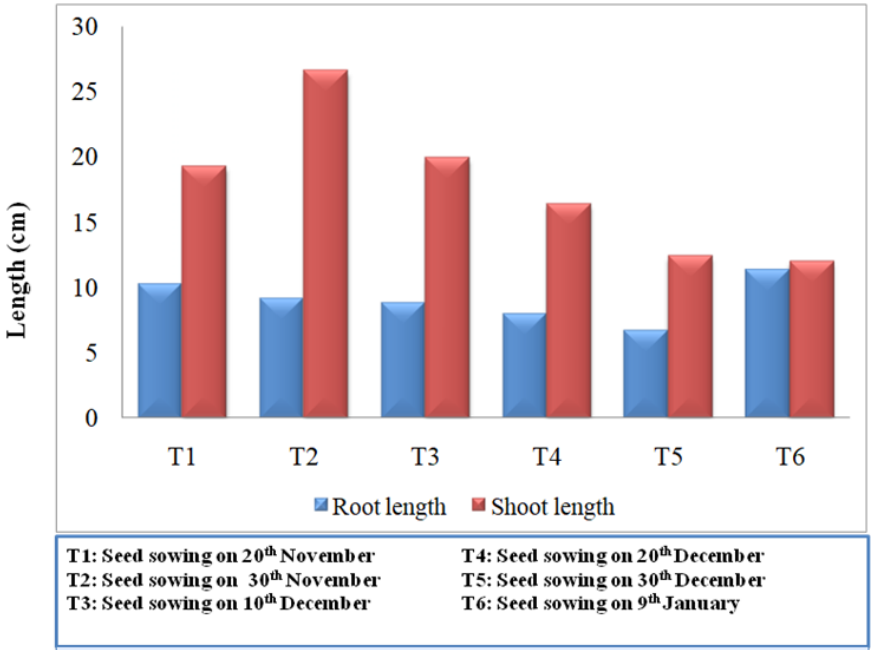

Fig. 2. Effect of different date of sowing on rice seedling root and shoot lenth

disease severity then the late sowing, while least disease severity occurred in early sowing in June. Present study, revealed that early sowing improved seed germination, reduced seedling mortality, root and shoot length. Minimum seedling mortality was also found in early sowing dates. Late sowing date treatments were found to have less germination and higher seedling mortality with fewer roots and shoot length. Rice seedling blight symptoms, including withered

tips, chlorosis, stunting, yellow leaves, leaf drop, root-growth inhibition, and crown rot, were observed on rice plants in nursery beds due to *Fusarium tricinctum* [10].

4. CONCLUSION

Results of present study conclude that highest per cent seed germination, minimum seedling mortality and good root and shoot growth were observed in rice nursery sown between 20-30 November. This study very useful to farmers of Gujarat those cultivated rice during summer season.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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